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Walter A. Post, Civil Engineer, Newport News, Virginia, U.S.A. (proposed by S. W. Burnham);

Alexander William Roberts, Mathematical Master, Alice, Lovedale, Cape Colony (proposed by David Gill).

Sixty-eight presents were announced as having been received since the last meeting, including, amongst others—

Bulletin du Comité International pour l'exécution photographique de la Carte du Ciel, tome ii., fasc. 2, presented by the French Academy; Ch. Dufour, La Scintillation des Etoiles, presented by the Author; German Transit of *Venus* Commission, Bericht über die deutschen Beobachtungen, herausgegeben von A. Auwers, Band V., presented by the Commission; F. Tisserand, Traité de Mécanique Céleste, tome iii., presented by the Author; Webb's Celestial Objects, new edition, vol. i., by the Rev. T. E. Espin, presented by the Publishers; Original negatives of *Jupiter*, and copies of Mr. Schaeberle's photographs of the Corona of 1893 April, presented by the Lick Observatory.

Mean Areas and Heliographic Latitudes of Sun-spots in the year 1891, *deduced from Photographs taken at the Royal Observatory, Greenwich, at Dehra Dûn (India), and in Mauritius.*

(*Communicated by the Astronomer Royal.*)

The results here given are in continuation of those printed in the *Monthly Notices*, vol. lii., p. 24, and are deduced from the measurements of solar photographs taken at the Royal Observatory, Greenwich, at Dehra Dûn, India, and at the Royal Alfred Observatory, Mauritius.

Table I. gives the mean daily areas of umbræ, whole spots, and faculæ for each synodic rotation of the Sun in 1891; and Table II. gives the same particulars for the entire year 1891, and for the two preceding years, for the sake of comparison. The areas are given in two forms. First, projected areas, that is to say, as seen and measured on the photographs, these being expressed in millionths of the Sun's apparent disc; and next, areas as corrected for foreshortening, the areas in this case being expressed in millionths of the Sun's visible hemisphere.

Table III. exhibits for each rotation in 1891 the mean daily area of whole spots, and the mean heliographic latitude of the spotted area, for spots north and for spots south of the equator, together with the mean heliographic latitude of the entire spotted area, and the mean distance from the equator of all spots; and Table IV. gives the same information for the year as a whole, similar results for 1889 and 1890 being added as in the case of

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Table II. Tables II. and IV. are thus in continuation of the similar tables on pp. 381 and 382 of vol. xlix. of the *Monthly Notices.*

It will be noticed that the results for 1889 are also given in Table IV. in several parts. That year being the year of minimum, the spots during the earlier months were situated close to the equator, but after the minimum was passed, and the new cycle had commenced, spots appeared in much higher latitudes. No spots at all were seen either in the northern or southern hemisphere in the zones of mid-latitude; two zones, 8° broad, and having their centres in lat. 15° north and south respectively, being entirely barren. Up till June 28 not a single spot with a latitude over 11° was observed; on June 29 and 30 a small spot was seen in south lat. 40°. A second high latitude spot was seen on July 26, and they then began to become more numerous. On September 4 a small low latitude spot was seen for the last time, and for three months all the spots observed were in high latitudes. The year has therefore been divided into three periods: January 1 to June 28, when all the spots were in low latitudes; June 29 to September 4, when spots were seen both in high and low latitudes; and September 5 to December 31, when activity was almost entirely confined to the high latitude zones. And in each period the high and low latitude spots have been exhibited separately, the broad barren zone above alluded to marking off the two districts most unmistakably.

TABLE I.

No. of Rotation.	Date of Commencement of each Rotation.	No. of days on which Photographs were taken.	Mean of Daily Areas.					
			Projected.			Corrected for Foreshortening		
			Umbræ.	Whole Spots.	Faculæ.	Umbræ.	Whole Spots.	Faculæ.
	1890.							
498	Dec. 21·75	27	6·2	41·7	368	6·7	58·3	689
	1891.							
499	Jan. 18·09	26	66·1	385	601	41·7	240	693
500	Feb. 14·43	27	67·0	353	641	50·9	270	714
501	Mar. 13·76	27	61·3	278	731	46·7	225	840
502	Apr. 10·05	27	72·9	444	760	56·9	370	888
503	May 7·30	27	142	825	1276	94·8	596	1256
504	June 3·51	28	131	865	1824	88·3	610	1600
505	June 30·71	27	246	1458	2183	183	1133	2336
506	July 27·91	27	92·4	670	1804	71·3	578	1917
507	Aug. 24·14	28	243	1608	1227	170	1207	1415
508	Sept. 20·41	27	159	1044	1990	117	823	2096
509	Oct. 17·69	27	67·3	422	1577	44·6	288	1710
510	Nov. 13·99	28	140	807	1513	95·4	593	1685
511	Dec. 11·31	27	183	1141	1792	129	864	1915

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TABLE II.

Year.	No. of Days on which Photographs were taken.	Mean of Daily Areas. Projected. Umbræ.	Projected. Whole Spots.	Projected. Faculæ.	Corrected for Foreshortening. Umbræ.	Corrected for Foreshortening. Whole Spots.	Corrected for Foreshortening. Faculæ.
1889	360	17·9	103	107	13·1	78·0	131
1890	361	21·3	133	273	15·5	99·4	304
1891	363	120	745	1322	86·2	569	1412

The rotations in Table I. and Table III. are numbered in continuance of Carrington's series (*Observations of Solar Spots made at Redhill*, by R. C. Carrington, F.R.S.), No. 1 being the rotation commencing 1853 November 9. The assumed prime meridian is that which passed through the ascending node at mean noon on 1854 January 1, and the assumed period of the Sun's sidereal rotation is 25·38 days. The dates of the commencement of the rotations are given in Greenwich civil time, reckoning from mean midnight.

TABLE III.

No. of Rotation.	Date of Commencement of each Rotation.	No. of Days on which Photographs were taken.	Spots North of the Equator. Mean of Daily Areas.	Spots North of the Equator. Mean Heliographic Latitude.	Spots South of the Equator. Mean of Daily Areas.	Spots South of the Equator. Mean Heliographic Latitude.	Mean Heliographic Latitude of Entire Spotted Area.	Mean Distance from Equator of all Spots.
	1890. d			°		°	°	°
498	Dec. 21·75	27	9·7	23·22	48·6	26·33	−18·11	25·81
	1891.							
499	Jan. 18·09	26	105	18·86	135	26·86	− 6·78	23·35
500	Feb. 14·43	27	242	19·17	28	22·66	+14·84	19·53
501	Mar. 13·76	27	221	19·73	3·5	25·38	+19·02	19·81
502	Apr. 10·05	27	149	22·36	221	20·45	− 3·20	21·22
503	May 7·30	27	316	18·20	280	20·57	+ 0·01	19·31
504	June 3·51	28	486	18·40	124	19·32	+10·72	18·58
505	June 30·71	27	1049	19·67	84·4	20·87	+16·65	19·76
506	July 27·91	27	337	21·09	240	18·38	+ 4·66	19·96
507	Aug. 24·14	28	1175	21·47	32·3	22·69	+20·29	21·51
508	Sept. 20·41	27	400	20·78	423	18·64	+ 0·51	19·68
509	Oct. 17·69	27	284	18·29	3·9	19·22	+17·79	18·30
510	Nov. 13·99	28	219	19·48	374	18·78	− 4·67	19·04
511	Dec. 11·31	27	567	25·09	297	18·46	+10·12	22·81

The chief features of the Sun-spot record for 1891 as brought out by the preceding tables are :—(1) The great increase in the mean daily area of umbræ, whole spots and faculæ; an increase which is proportionately about the same for the umbræ and whole spots, but not quite so strongly marked for the faculæ. The ratios which the areas for 1891 bear to those of 1890 are 5·56 and 5·72 respectively in the two former cases, in the last case 4·65.

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The minimum, therefore, has been evidently passed, and the new cycle is rapidly progressing towards full vigour.

(2) The high latitude occupied by the spots. The overwhelming majority have shown a latitude of more than 14°, less than 3 per cent. of the total spotted area lying nearer the equator than 13°·5, whilst the mean distance from the equator of all spots has been 20° 31′. This, though higher than the value for 1880, the corresponding year of the last cycle, was lower than that for 1890, and thus affords a second indication that the new cycle is in full action.

(3) A third feature is the predominance of spots in the northern hemisphere. If the precedent of the last cycle hold good, this also is typical of the earlier days of a new cycle. On the whole, therefore, the record for 1891 would indicate not merely that the minimum was past, and the rise towards maximum in full force, but also, from both the areas and latitude being greater than in 1880, and from the predominance of the northern hemisphere being more pronounced, that the approaching maximum will be more strongly marked than was the case with that of 1883.

Table IV.

Period.	No. of Days on which Photographs were taken.	Spots North of the Equator.		Spots South of the Equator.		Mean Heliographic Latitude of Entire Spotted Area.	Mean Distance from Equator of all Spots.
		Mean of Daily Areas.	Mean Heliographic Latitude.	Mean of Daily Areas.	Mean Heliographic Latitude.		
1889. Low Spots.							
Jan. 1–June 28	177	7·9	5°·36	45·5	5°·44	− 3°·85	5°·43
June 29–Sept. 4	65	2·9	2·69	133·0	7·26	− 7·05	7·16
Sept. 5–Dec. 31	118	0	...	5·0	8·73	− 8·73	8·73
1889. High Spots.							
Jan. 1–June 28	177	0	...	0	...	...	...
June 29–Sept. 4	65	0	...	84·1	21·96	−21·96	21·96
Sept. 5–Dec. 31	118	1·8	23·94	30·0	22·95	−20·29	23·01
All Spots.							
1889	360	5·0	7·26	73·0	11·90	−10·68	11·61
1890	361	53·1	22·20	46·3	21·75	+ 1·73	21·99
1891	363	401	20·49	169	19·91	+ 8·52	20·31

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On the Dark Poles and Bright Equatorial Belt of the First Satellite of Jupiter. By E. E. Barnard, M.A.

It will, perhaps, be remembered that on 1890 September 8, while observing the transit of the first satellite of *Jupiter* with the 12-inch equatorial, the satellite appeared as a dusky elongated spot projected on a bright region of *Jupiter*. With a high power it appeared distinctly double, on a line nearly vertical to the belts of *Jupiter*. I called Mr. Burnham's attention to it, and we both saw it thus for upwards of half an hour. Subsequently it was seen several times when crossing a dark portion of the planet as a bright, very elongated spot, but the elongation in these cases was nearly parallel to the belts of *Jupiter*. Yet when closely examined on the sky it always appeared perfectly round.

An account of these observations will be found in *Monthly Notices*, vol. li., No. 9. To explain these singular peculiarities I at that time offered two theories: the first of these was that the satellite was itself possibly double. This idea has long since been abandoned because of its improbability. The second theory supposed the satellite to be surrounded with a white equatorial belt, and that its poles were dark or dusky, and that it rotated on an axis nearly perpendicular to its orbit. If such were the case, when the satellite crossed a bright portion of the planet the white belt would cut it apparently in two, as it would be equal in brightness to the surface of *Jupiter*, and thus leave the two dark polar caps as two separate spots nearly perpendicular to the belts of *Jupiter*, and would thus give the observed appearance of duplicity.

If, however, the satellite should happen to be projected on a dark belt, then the dark poles would merge into the surface of *Jupiter*, and the white equatorial belt alone would be visible as an elongated white spot nearly parallel to the belts of *Jupiter*.

It was not until this year (1893) that an opportunity occurred to settle this question with the 36-inch.

On September 25 last the transit of this satellite was watched with the great telescope. It first appeared as an elongated white spot, east and west, when over the dusky region near the planet's limb, and later it appeared as two dusky spots in a line north and south, exactly as it appeared in the 12-inch 1890 September 8. But during moments of good definition it was seen distinctly as a small round disc, dusky at the poles, and with a white belt between them.

On November 11 it was again observed under nearly similar conditions, and presented the same phenomena.

The best view of these dark polar caps and bright belt was had on November 19, with a power of 1,000 diameters on the great telescope, and almost perfect seeing.